

Claims

We claim:

1. A multi-layer barrier for a ferroelectric capacitor comprising:
 5. an outdiffusion barrier layer permeable to both hydrogen and oxygen and covering the ferroelectric of the capacitor, the outdiffusion barrier layer allowing oxygen to pass through it into the ferroelectric during an oxygen anneal to repair damage to the ferroelectric, the outdiffusion barrier layer reducing the decomposition of the ferroelectric by blocking molecules leaving the ferroelectric
10 during the oxygen anneal; and
 - a hydrogen barrier layer deposited on the outdiffusion barrier layer after repair of the ferroelectric by the oxygen anneal, the hydrogen barrier layer causing the multi-layer barrier to block the passage of hydrogen into the ferroelectric during back-end processes.
- 15 2. The multi-layer barrier of Claim 1, wherein the outdiffusion barrier layer is comprised of Al₂O₃.
3. The multi-layer barrier of Claim 1, wherein the hydrogen barrier layer is
20 comprised of Al₂O₃.
4. The multi-layer barrier of Claim 1; wherein the hydrogen barrier layer is thicker than the outdiffusion barrier layer.
- 25 5. The multi-layer barrier of Claim 1, wherein the ferroelectric includes PZT.

6. The multi-layer barrier of Claim 1, wherein the oxygen anneal is performed at a temperature of at least approximately 500C.

5 7. The multi-layer barrier of Claim 1, wherein the outdiffusion barrier layer reduces the decomposition of the ferroelectric by blocking lead molecules from leaving the ferroelectric during the oxygen anneal.

8. The multi-layer barrier of Claim 1, wherein the outdiffusion barrier layer 10 reduces the decomposition of the ferroelectric by blocking lead molecules from leaving the ferroelectric during the oxygen anneal.

9. The multi-layer barrier of Claim 1, wherein the outdiffusion barrier layer is deposited by sputtering.

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10. The multi-layer barrier of Claim 1, wherein the hydrogen barrier layer is deposited using sputtering or atomic layer deposition.

11. A method for manufacturing a multi-layer barrier for a ferroelectric 20 capacitor comprising the steps of:
depositing on the ferroelectric of the capacitor an outdiffusion barrier layer permeable to both hydrogen and oxygen;
performing an oxygen anneal to repair damage to the ferroelectric;

allowing oxygen to pass through the outdiffusion barrier layer to the ferroelectric while using the outdiffusion barrier layer to reduce decomposition of the ferroelectric during the oxygen anneal;

- depositing a hydrogen barrier layer on the outdiffusion barrier layer after
5 repair of the ferroelectric by the oxygen anneal;

and

using the multi-layer barrier with the deposited hydrogen barrier layer to block the passage of hydrogen into the ferroelectric during back-end processes.

10 12. The method of Claim 11, wherein the outdiffusion barrier layer is comprised of Al₂O₃.

13. The method of Claim 11, wherein the hydrogen barrier layer is comprised of Al₂O₃.

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14. The method of Claim 11, wherein the hydrogen barrier layer is thicker than the outdiffusion barrier layer.

15. The method of Claim 11, wherein the ferroelectric includes PZT.

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16. The method of Claim 11, wherein the oxygen anneal is performed at a temperature of at least approximately 500C.